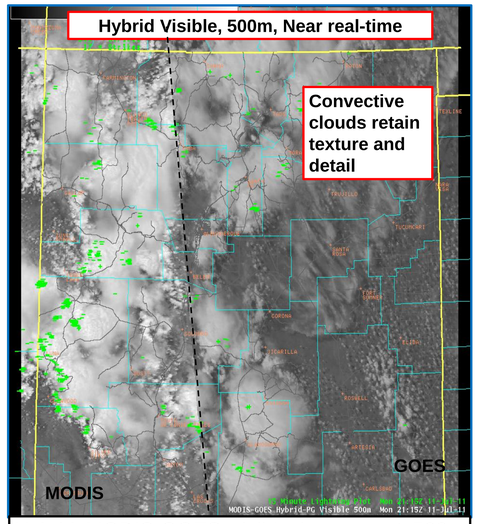
NASA SPoRT GOES-R Proving Ground Activities

[1]Kevin K. Fuell, [2]Gary Jedlovec, [2]Andrew L. Molthan, [1]Matthew Smith, [3]Geoffrey Stano, [4]Kevin McGrath, and [2]Brad Zavodsky

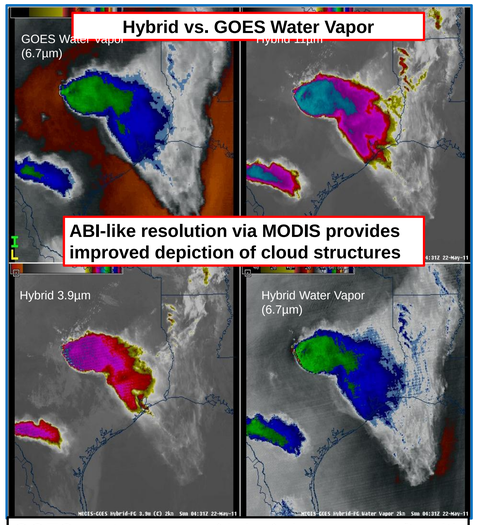
[1]University of Alabama Huntsville, [2]NASA Earth Science Office, Huntsville, Alabama, [3]ENSCO, [4]Jacobs Engineering Group, Inc, Huntsville, Alabama

kevin.fuell@nasa.gov

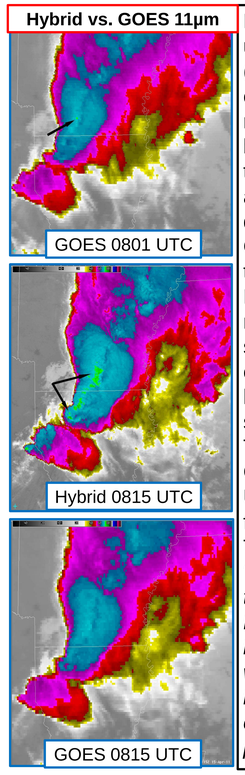
Product(s)	Description	Application
Pseudo-GLM Flash Extent, Flash Maximum, and Flash Initiation Densities	Approximation of a GLM-type product from ground-based lightning detection networks. Gridded data is transformed to the GLM expected resolution (~8km). Flash extent is accumulation of flashes in 2-minutes passing through grid box, while "initiation" product sums flashes originating in a grid box. Maximum density is the last 30 minutes of flashes within a grid box.	Total lightning complements application of Doppler radar, especially in marginally severe environments, allowing forecasters to anticipate which storms are more likely to have severe weather based on which are most electrically active. This product has been repeatedly seen by the Huntsville WFO and participants at the Hazardous Weather Testbed as an invaluable resource.
Hybrid GOES-POES Single Channel Imagery - Visible, 11µm, 3.9µm, Water Vapor	Imagery from MODIS and VIIRS polar-orbiting instruments are inserted to GOES imagery. These current instruments provide a real-time proxy to the future ABI imagery. The hybrid concept allows forecasters to loop the imagery, as they typically would in operations, and provides context in between passes of the polar-orbiting instruments.	Visible imagery has been used to better differentiate cloud features such as fog and gravity waves from the more coarse GOES imagery. The infrared imagery depicts hotspots, cloud top temperatures and enhanced-V signatures with more accuracy. Numerous examples of the hybrid as a decision aid can be seen via the SPoRT Blog (http://nasasport.wordpress.com/)
Hybrid GOES-POES Multi-Channel Imagery – Air Mass RGB	EUMETSAT recipes for multi-channel imagery via MODIS and VIIRS demonstrate the future capabilities to combine numerous channels from ABI. These imagery are inserted into a base GOES single channel to provide context and the ability to loop the imagery. Presently, the Air Mass RGB is inserted into Water Vapor imagery, with other combinations to follow.	The Air Mass RGB / Water Vapor hybrid imagery product is applied to identifying upper level dynamics such as jet streaks and potential vorticity as well as temperature and moisture characteristics. The product has been used to analyze the stage of cyclone development and air mass boundaries. Also, mid-level clouds are more apparent than in water vapor imagery alone.
RGB Imagery - Natural Color, True Color, Dust, Night-time Microphysics, Air Mass	Multiple channels or channel differences are combined in a red, green, and blue color composite. Shades of colors represent various physical aspects of the atmosphere or land surface in a qualitative sense.	With 16 channels anticipated from ABI, RGB imagery represents an efficient method to identify multiple features within a single product. Air Mass and Dust RGB imagery are being applied by WFOs and National Centers. For example, dust plumes from the southwest U.S. as well as outbreaks of dust from tropical western Africa have been easily identified over traditional visible or true color imagery.
Convective Initiation	This is the Algorithm Working Group product from the University of Alabama Huntsville. It uses present GOES channel differences and the trend in these differences to estimate strength of convective growth. The calculated value is compared with a database of similar cases to estimate the likelihood that 35dBZ echoes will occur. *(See example on right of this poster)*	Forecasters are able to use the product to identify cloud structures that are likely to become severe storms. The trend in the convective initiation signal provides additional lead time over radar-only analysis of developing thunderstorms. Evaluation of the product by four forecast offices has shown lead times of up to 45 minutes.
Quantitative Precipitation Estimate	This is the Algorithm Working Group product from NOAA/NESDIS (Lead: Robert Kuligowski). Long-standing techniques of using GOES IR channels are employed to estimate the precipitation occurring under cold cloud tops of thunderstorms. Testing of the algorithm at high-latitudes of Alaska at forecast offices and the River Forecast Center (RFC) has been the primary collaborative focus between SPoRT and NESDIS. *(See example on right of this poster)*	Satellite-based estimates of precipitation are desired in areas of poor or lacking radar coverage. The Alaska RFC is evaluating the product for high latitude use where radar coverage is lacking. The Pacific region has large marine areas where the product will provide value outside of radar range. CONUS users at WFOs are able to better analyze atmospheric rivers and make comparison to radar and ground estimates of precipitation.



Hybrid MODIS-GOES visible imagery at 500m over New Mexico. ABI-like imagery from near real-time MODIS is on the left while standard GOES imagery is on the right. Forecaster (**Albuquerque, NM**) feedback via SPoRT blog noted, "*extraordinary detail of the cloud structures over western NM compared to the more smoothed look to the convective clouds over eastern NM.*"



GOES water vapor (4 km) in upper left with Hybrid MODIS-GOES imagery showing ABI-like imagery of 11µm, water vapor (6.7µm), and 3.9µm (counter clockwise). The **Houston/Galveston** forecaster noted wave cloud features north of the storm and more clearly enhanced-V and anvil structures in the 11µm. Water vapor imagery better depicts dry inflow west of storm.



Nashville, TN forecasters used the Hybrid imagery (top image) to see examples of how ABI retrievals on GOES-R will better sense cloud top temperature. At 0801 UTC a green pixel at -72C is detected by the current GOES imager. But after the ABI-like data (i.e. MODIS) is inserted, the middle image at 0815 UTC shows a greater line of cold cloud tops in the same location and to the southwest down to -78C. The lower image is the GOES imager at 0815 UTC showing little change from the 0801 UTC image. Their feedback: *"Undoubtedly, when the GOES-R proxy (i.e. MODIS) image is inserted, it provides a meteorologist with much more information than just the current GOES data provides. "*